

**PROPOSAL OF PRELIMINARY EXPLORATION (G-3 LEVEL) FOR
DIAMOND IN TIKAMGARH CLUSTER – COMPRISING OF FOUR SUB-BLOCKS'
A to D (TOTAL AREA OF THE CLUSTER - 109.68 SQ.KM AREA)
DISTRICT- TIKAMGARH, MADHYA PRADESH**

COMMODITY: DIAMOND

BY

**MINERAL EXPLORATION CORPORATION LIMITED
DR. BABASAHAH AMBEDKAR BHAWAN
SEMINARY HILLS
NAGPUR - MAHARASHTRA**

**PLACE: NAGPUR
DATE: 13.04.2022**

Summary of the Block for Preliminary exploration (G-3 Level)
GENERAL INFORMATION ABOUT THE BLOCK

Sl. No	Features	Details
1	Block ID	Tikamgarh Diamond Blocks
2	Exploration Agency	Mineral Exploration Corporation Limited (MECL)
3	Commodity	Diamond
4	Mineral Belt	Bundelkhand Gneissic Complex
5	Completion period with entire Time schedule to complete the project	15 Months
6	Objectives	Based on the evaluation of available geological data, the present exploration program has been formulated to fulfil the following objectives: i) To collect surface (stream sediment / slope wash) samples for separation of Heavy minerals samples, Hand picking of suspected Heavy minerals grains and analyzing the suspected grains for EPMA which will decide further course of exploration program. ii) Soil surface Mapping on 1:12500 scale for tracing possible Yellow/Blue ground (Weathered Kimberlite) for drilling few scout boreholes. iii) Geophysical Survey in the entire block for studying radial/circular anomalies, structures and identifying favourable zones for Kimberlite / Lamproite zones. iv) Exploration program will be done in two phases in Phase-I: Stream sediment/slope wash samples will be extracted from 2nd to 5th order streams and on the basis of analytical results for same, follow up samples will be extracted from demarcated potential sub blocks i.e., under G-3 stage. v) In Phase-II Geophysical Survey, a few scout boreholes shall be drilled involving about 500m to know the depth persistence of the host rock in case, analytical results from phase-I being encouraging and supported by sub-surface positive details of extension of host rock by various Ground Geophysical survey techniques at G-3 level vi) To estimate geometry of kimberlite body with inferred resources of diamond in hosted rock as per UNFC norms and Minerals (Evidence of Mineral Contents) Rules-2015 at G-3 level mineral exploration
7	Whether the work will be carried out by the proposed agency or through outsourcing and details thereof. Components to be outsourced and name of the outsource agency	Work will be carried out by the proposed agency (MECL).
8	Number of Geoscientists	Three nos. Geoscientist (2 Field + 1HQ)
9		Geologist Party days:180 Field and 90 HQ

Sl. No	Features	Details
	Expected Field days (Geology, Geophysics, surveyor)	Sampler Party Days: 60 days

1.	Location																																																																																		
	Co-ordinates of the block Latitude& Longitude Tikamgarh Diamond block is a cluster of four blocks as sub-blocks A, B, C, D. Total area of the Tikamgarh Cluster is 109.68 sq.km.	<table><tr><th>Block & Area (sq.km)</th><th>Corner Point</th><th>Latitude</th><th>Longitude</th></tr><tr><td rowspan="4">Tikamgarh-A 10.96</td><td>A</td><td>25°11'37.00"</td><td>78°40'00.00"</td></tr><tr><td>B</td><td>25°13'27.00"</td><td>78°40'00.00"</td></tr><tr><td>C</td><td>25°13'27.00"</td><td>78°38'05.00"</td></tr><tr><td>D</td><td>25°11'37.00"</td><td>78°38'05.00"</td></tr><tr><td rowspan="12">Tikamgarh-B 76.21</td><td>A</td><td>25°13'11.61"</td><td>78°47'17.00"</td></tr><tr><td>B</td><td>25°13'09.04"</td><td>78°48'31.52"</td></tr><tr><td>C</td><td>25°12'04.79"</td><td>78°50'07.89"</td></tr><tr><td>D</td><td>25°09'04.91"</td><td>78°49'28.06"</td></tr><tr><td>E</td><td>25°07'13.12"</td><td>78°47'32.42"</td></tr><tr><td>F</td><td>25°08'59.77"</td><td>78°43'47.56"</td></tr><tr><td>G</td><td>25°10'55.41"</td><td>78°44'19.68"</td></tr><tr><td>H</td><td>25°13'11.61"</td><td>78°47'17.00"</td></tr><tr><td>I</td><td>25°13'09.04"</td><td>78°48'31.52"</td></tr><tr><td>J</td><td>25°12'04.79"</td><td>78°50'07.89"</td></tr><tr><td>K</td><td>25°09'04.91"</td><td>78°49'28.06"</td></tr><tr><td rowspan="4">Tikamgarh - C 2.35</td><td>A</td><td>25°01'22.00"</td><td>78°39'40.00"</td></tr><tr><td>B</td><td>25°01'22.00"</td><td>78°40'34.00"</td></tr><tr><td>C</td><td>25°02'12.00"</td><td>78°39'40.00"</td></tr><tr><td>D</td><td>25°02'12.00"</td><td>78°40'34.00"</td></tr><tr><td rowspan="4">Tikamgarh - D 20.16</td><td>A</td><td>25°57'25.00"</td><td>78°41'14.00"</td></tr><tr><td>B</td><td>25°57'25.00"</td><td>78°44'31.00"</td></tr><tr><td>C</td><td>25°58'60.00"</td><td>78°44'31.00"</td></tr><tr><td>D</td><td>25°58'60.00"</td><td>78°41'14.00"</td></tr><tr><td colspan="4">Total area for Tikamgarh – 109.68 sq.km</td></tr></table>	Block & Area (sq.km)	Corner Point	Latitude	Longitude	Tikamgarh-A 10.96	A	25°11'37.00"	78°40'00.00"	B	25°13'27.00"	78°40'00.00"	C	25°13'27.00"	78°38'05.00"	D	25°11'37.00"	78°38'05.00"	Tikamgarh-B 76.21	A	25°13'11.61"	78°47'17.00"	B	25°13'09.04"	78°48'31.52"	C	25°12'04.79"	78°50'07.89"	D	25°09'04.91"	78°49'28.06"	E	25°07'13.12"	78°47'32.42"	F	25°08'59.77"	78°43'47.56"	G	25°10'55.41"	78°44'19.68"	H	25°13'11.61"	78°47'17.00"	I	25°13'09.04"	78°48'31.52"	J	25°12'04.79"	78°50'07.89"	K	25°09'04.91"	78°49'28.06"	Tikamgarh - C 2.35	A	25°01'22.00"	78°39'40.00"	B	25°01'22.00"	78°40'34.00"	C	25°02'12.00"	78°39'40.00"	D	25°02'12.00"	78°40'34.00"	Tikamgarh - D 20.16	A	25°57'25.00"	78°41'14.00"	B	25°57'25.00"	78°44'31.00"	C	25°58'60.00"	78°44'31.00"	D	25°58'60.00"	78°41'14.00"	Total area for Tikamgarh – 109.68 sq.km			
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	Villages	Sunrai Khas, Papawani, Dhauna, Chhevalmata ka Khirk, Jherakhas, Acharra, Kumharanyas, Hanota, Darganykalan, Panchampura, Part of Mohangarh Reserve Forest (54L9) Jalandarpur, Gailwara, Bachora, Part of Birorakhet Reserve Forest (54 K16), Birrorakhet, Uttara Birori, & Prithvipur																																																																																	
	Tehsil/Taluk	Prithvipur, Jatara and Tikamgarh																																																																																	
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	Forest Area	The block area partly covered by reserve forest (High ridges). Not Inviolate																																																																																	

	Government Land Area (Bilanam)	Data not available
	Charagaha	Data not available
	Private Land Area	Data not available
3.	Accessibility	
	Nearest Rail Head	Tikamgarh Railway Station (70 km)
	Road	The area can be approached by metalled Road form Jhansi-Tikamgarh highway-539 and also by NH-44 along Shahjad Dam Road.
	Airport	Khajuraho (135 km)
4.	Hydrography	
	Local Surface Drainage Pattern (Channels) Rivers/ Streams	Betwa, Jamni and Dahsan are major rivers present in this block, which area characterised by dendritic drainage pattern with a number of small streams and nalas originating from them. Five blocks fall under Betwa and Jamni watershed basin.
5.	Climate	
	Mean Annual Rainfall	The average rainfall of the Tikamgarh district is 1000mm, based on the rain-gauge stations at respective tehsils, The districts receive maximum rainfall during south-west monsoon period (i.e., June to September) and about 91% of annual rainfall is received during this period. 9% of the remaining annual rainfall takes place between period November to May.
	Climate	The climate of Tikamgarh district is semi- tropical, characterized by hot summer and well distributed rainfall during the south west monsoon season. Mean monthly max. temperature of the district varies between 42° c in May, which is the hottest month and January is the coldest month with the temperature falling as low as 24.3°C. Mean monthly minimum temperature of the district varies between 26° c in June to 7°C in January.
6.	Topography	
	Toposheet Number	No.54 L/09&54 K/12, 16
	Morphology of the Area	Geographically, Tikamgarh forms nearly the centre of the Bundelkhand Region that lies between the Vindhyan plateau in the south and the great Ganga-Yamuna plains in the north. Like the region in general, the district has a distinct slope toward the north-east. The slope is relatively more marked in Tikamgarh district, because the southwestern parts of the district nearly touches the high Vindhyan plateau Geomorphologically, the district is dominated by pediplains formed by the erosion of Granites. Harder rock material resistant to erosion has taken the form of Inselbergs. Such Inselbergs, rising sharply from the surface in a conical form, are a distinctive feature of Tikamgarh. The pediplains that cover three-fourth of the surface are moderately buried by weathered material offering good support for agriculture. Near Betwa and Jamni in the north, there is an extent of weathered bedrock with thin or no soil cover; such a landform is termed shallow Buried Pediment.
7.	Availability of baseline geoscience data	
	Geological Map (1:50K/25K)	Geological Map (1:50,000 scale) from Bhukosh

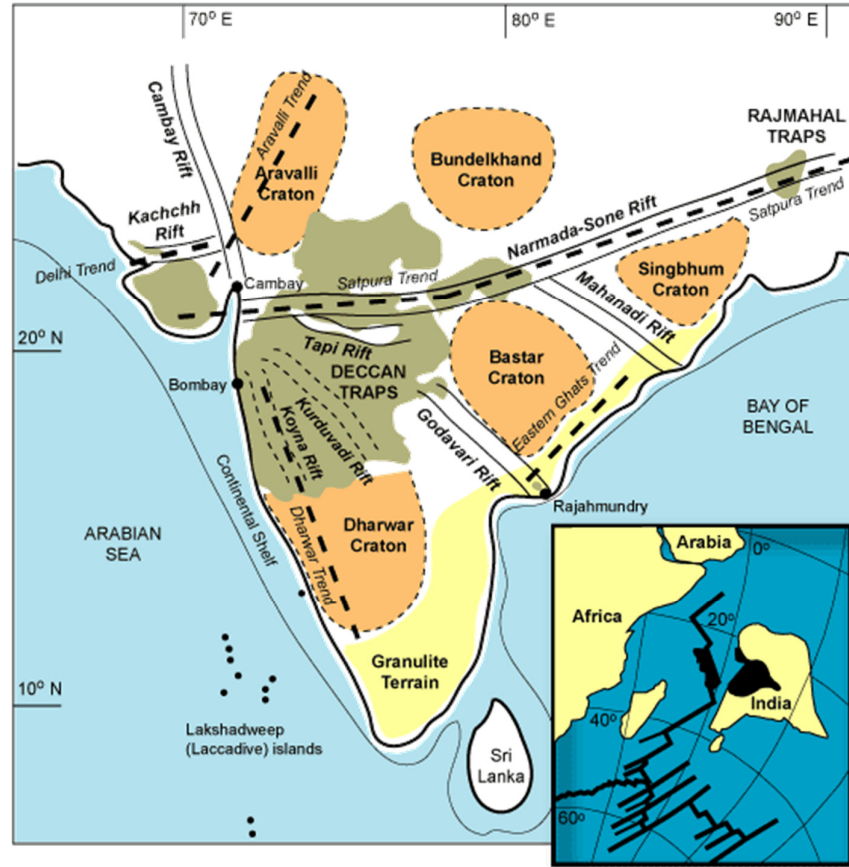
	Geochemical Map	Available.
	Geophysical Data (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Not available.
8.	Justification for taking up Preliminary Exploration/ Regional Exploration	i) F.S. 2002-2003, Shri Rajeshwar Paul Sr. Geologist had carried out work by integration of aeromagnetic, Radiometric, drainage and prognosis map for identifying the Kimberlite clan of rocks. Outcome was Kimberlite Indicator mineral i.e Magnesium Chromite was found in 2 stream sediments 2km south of Orchha and lamproite bodies are suspected near villages Bijauli and Gujjara Kalan these areas fall with 15-20km radius of present proposed block. ii) Recognizing, that the source for the detrital diamonds recovered from the Vindhyan beds at different locations of 100km long Panna Diamond Belt (PDB) may be from conceivable pipes in area north of Vindhyan basin i.e., in the region presently occupied by the Bundelkhand Granites, Hence NMDC approached DGM, MP and was awarded an area of 2092 sq.km under Reconnaissance Permit (RP) (2009-2012). iii) NMDC has carried out literature study, geological mapping in 1:50000 scale and structural elements using Remote Sensing data, identified anomalies and probable zones of diamond occurrences for further ground sampling and exploration. NMDC collected 348 stream sediments were collected from entire RP area and processed the same using Gerrytz Jigs and subsequent TBE and Magnetic separation, visual identification of indicator minerals. Basing on the outcome of the work as said above, an area of 1000sq.km is considered interesting for further exploration. iv) NMDC conducted follow-up sampling in 1000 sq.km area of about 70 stream sediment samples (-2mm) from various second and third order streams, visual picking, microscopic sorting, EPMA analysis was done for recovered Kimberlite indicator minerals (KIMS) chromite and picro-ilmenite from various catchments based on KIM's identified NMDC demarcated five (5) blocks for further Prospecting and applied for PL. Same blocks are proposed for G-3 level of exploration in this proposal. v) Prospecting and limited exploration has been carried out in this area to identify source of Kimberlite Indicator mineral; hence, the preliminary exploration will be helpful in demarcation of diamond hosted rock in the area vi) The Preliminary survey will be helpful in planning of detailed exploration program at G-2 level which in turn will facilitate the state government for auction of the block.

**PROPOSAL OF RECONNAISSANCE SURVEY (G-3 LEVEL) FOR
DIAMOND IN FOUR (4) BLOCK'S A-E (109.68 SQ.KM AREA)
DISTRICT- TIKAMGARH, MADHYA PRADESH**

1.0.0 Preamble

- 1.0.1 Diamond being one of the highly priced gem have lured the mankind since time immemorial. With the growth of India in economic front, general population now has the affordability of Diamond Jewellery. Due to the affordability, demand for diamonds has increased drastically. India though is a centre for Diamond cutting industry, majority of rough diamonds are imported. The increasing demand of Diamonds has been accorded high priority in the XIIth Plan document.
- 1.0.2 India has the distinction of producing many of the historically famous diamonds like the Kohinoor (186 ct), the Great Moghul (787 ct), the Hope (67ct), Nizam (440ct), Pitt/Regent (410 ct), Orloff (300 ct) and Daryainoor (185 ct). Till the discovery of the Brazilian diamond fields, India was leading in diamond mining.
- 1.0.3 Since last century, no large diamond deposits have been discovered in India except recent discovery of “Bunder - Atri” by Rio-Tinto Exploration (RTE) in Bakshwaha Tehsil, Chhatarpur District of Madhya Pradesh State. However, the possibility of working of small mineral bodies in proximity to each other, through technological advances and increased operational efficiency, cannot be ruled out. Therefore, it is necessary to locate and explore such small sized deposits in clusters.
- 1.0.4 As per the NMI data, based on UNFC system as on 1.4.2015, all India reserves/resources of diamond have been placed at 31.83 million carats. Out of these, 0.95 million carats are placed under Reserves category and 30.87 million carats under remaining Resources category. By grades, about 2.37% resources are of Gem variety, 2.64% of Industrial variety and bulk of the resources (95%) are placed under Unclassified category. By States, Madhya Pradesh accounts for about 90.18% resources followed by Andhra Pradesh 5.72% and Chhattisgarh 4.09%.
- 1.0.5 Diamond occurrences are reported since prehistoric times in the country. Presently, diamond fields of India are grouped into four regions: i.e., 1) South Indian tract of Andhra Pradesh, comprising parts of Anantapur, Kadapa, Guntur, Krishna, Mahbubnagar and Kurnool districts; 2) Central Indian tract of Madhya Pradesh, comprising Panna belt; 3) Behradin-Kodawali area in Raipur district and Tokapal, Dugapal, etc. areas in Bastar district of Chhattisgarh; and 4) Eastern Indian tract mostly of Odisha, lying between Mahanadi and Godavari valleys.
- 1.0.6 The concept-oriented modelling and global strategy by Clifford (1966) reveals that the occurrence of diamondiferous kimberlites is restricted in the rigid cratonic nuclei of respectable antiquity (± 2000 my). In Bastar Craton there has been no major thermal activity after 2200 million years. Hence, the Proterozoic platformal belts over the stable cratonic area have been selected for exploration of kimberlite.

Fig-1: Cratonic blocks map of India (Modified after Radha Krishna, 1989), showing Kimberlite/Lamproite (Source-GSI)



EGMB: Eastern Ghats Mobile belt; B: Basna Kimberlite field; Bu: Bunder Lamproites; D: Damodar Valley Lamproites; K: Krishna Lamproite field; M: Majghawan Lamproite field; Mp: Mainpur Kimberlite field; Na: Nawapara Kimberlite field; N: Narayanpet Kimberlite field; NI: Nallamali lamproite field; Ra: Ramadugu lamproite field; R: Raichur Kimberlite field; T: Tungabhadra Kimberlite field; Tk: Tokapal Kimberlite field; W: Wajrakarur Kimberlite field.

1.1.0 Global scenario:

1.1.1 World production of diamond is reported mainly from Russia, Canada, Botswana, South Africa, Angola, DR Congo, Ghana, Namibia, Ivory Coast, Brazil and Guinea. The global diamond mining industry is largely dominated by a hand-full of companies. The top three companies – Alrosa from Russia, De Beers from Luxembourg, and British-Australian Rio Tinto – accounts for more than 60 percent of global diamond mine production.

Mined diamonds are mostly processed in and sold via the major global diamond centres: Antwerp, Dubai, New York, Hong Kong, Mumbai and Tel-Aviv. In contrast to precious metals, there is no universal market price per carat of diamonds. Nevertheless, global diamond prices have increased more than tenfold since 1960 to the prices today.

1.2.0 Global demand

Global diamond market has grown rapidly in recent years. Demand for rough as well as polished diamonds has mainly driven by industries such as automotive and jewellery. Growing global demand for diamond jewellery has a considerable impact on the growth of the global diamond market. The U.S. and China held major shares in the global

diamond jewellery market. The U.S. is regarded as the largest diamond jewellery market in the world. Its strong economic condition in the world aided it to hold such a definite position in the global diamond jewellery market. Global consumer demand for diamond jewellery continued to rise in 2018, driven by sustained growth in the US and increased demand in China. Growing middle class population in China derived a substantial growth in Chinese diamond jewellery market. The global diamond market was dominated by certain key players such as Alrosa, De Beers, Dominion Diamonds and Catoca. Strong performance of Alrosa and De Beers has derived a notable growth in the global diamond market.

1.3.0 India's demand:

- 1.3.1 India is one of the largest centre for cutting and polishing of raw diamonds. Due to Covid pandemic India's overall gross import of gems and jewellery for FY 2020-21 declined 32% to \$ 16.49 billion. This included a 16% year-on-year drop in gross imports of rough diamonds to \$ 10.88 billion. India's exports of cut and polished diamonds from India fell from \$ 18.66 billion to \$ 16.4 billion during FY 2020-21. Once market stabilises import and export will see better growth for the industry.

1.4.0 Employment generation

- 1.4.1 Employment generation is the natural process of social development. Equal employment opportunity is government policy. Population growth is one of the reasons for unemployment. Creating jobs is a keystone of any economic recovery program. The proposed Preliminary Survey (G-3 stage) for diamond in four (4) blocks is likely to generate opportunity of temporary employment on contract basis for short period for local peoples of this remote and rural areas of Tikamgarh district, Chhattisgarh.

1.5.0 Background

- 1.5.1 Gems and Jewellery export sector has been contributing about 13%-15% to India's total merchandise exports during the last five years. As per industry estimates, this sector employs more than 4.64 million employees. With a view to strengthen the Gems & Jewellery Industry in the country, the Government has taken a number of steps, such as, establishment of Special Notified Zone (SNZ); announcement of separate ITC HS Code for lab-grown diamonds; introduction of Gold Monetisation Scheme; amendment of wastage and value addition norms for gems and jewellery items; approved scheme for setting up of Common Facility Centres for Gem and Jewellery Sector; and providing financial assistance for participation in international fairs, organising buyer-seller meets etc. under Market Development Assistance (MDA) and Market Access Initiative (MAI) Schemes of the Department of Commerce. Findings of new deposits of diamond may boost the Indian Gems & Jewellery sector in near future.
- 1.5.2 Directorate Geology and Mining (DGM) Madhya Pradesh and MECL had MoU signed for exploration of minerals to convert them into auctionable blocks in the state of Madhya Pradesh. DGM, MP has accorded consent to MECL for taking up of diamond exploration in Tikamgarh blocks A, B, C, D, E blocks by Madhya Pradesh vide State Gazette notification No. F-19-2-2022-Barah-1-Khanij, dated 22nd Feb 2022. MECL intends to take up the exploration through NMET funding hence this proposal is presented in the TCC.

- 1.5.3 Government of Madhya Pradesh vide its letter no R 5117/469/2009/12-1 dated 30.09.2009 granted Reconnaissance Permit to National Mineral Development Corporation (NMDC) over an area of 2092 sq.km in Tikamgarh district of Madhya Pradesh for a period of 3 years. NMDC has carried out following studies to narrow-down the area
- (i) Remote sensing Studies
 - (ii) Structural analysis and Interpretation
 - (iii) Ground Geological Mapping
 - (iv) Stream Sediment Sampling
 - (v) Heavy Mineral Identification and analysis by EPMA.
 - (vi) Integration and overlay of multiple data sets to identify kimberlitic favourable zones
 - (vii) Recognition and selection of target areas, relinquishment of low priority areas.
- 1.5.4 NMDC carried out Geo-spatial modelling in GIS and Remote sensing application to identify probable zones for kimberlitic emplacement, with integration of data sets of
- (a) Lithostratigraphic layer derived from Remote-Sensing based interpretation taking reference of the existing published geological plans and ground checking
 - (b) Geological structure layer derived mainly from Remote-Sensing based data interpretation.
 - (c) Litho-stratigraphic anomalies, structural anomalies and morphological anomalies, intersection of lineaments, shear zones, occurrence of intrusives and circular anomalies.
- 1.5.5 Based on Geo-spatial modelling NMDC has carved out High-Medium-Low favourable zones for kimberlite emplacement. Subsequently 348 stream sediment samples were collected from trap sites and processed with Tetra Bromo Ethane (TBE) separation and magnetic separation and processed samples were despatched to M/s GDES, Australia for sorting, picking and identification of HIMS/KIMS of Kimberlitic affinity. Further after preliminary assessment, an area of 1000 sq.km was retained by NMDC for follow-up sampling in 2nd to 5th order streams and about 70no of samples were collected and processed with visual identification, microscopic examination and EPMA studies at M/s GDES, Australia. Identified five positive anomalies and selected 5 blocks for Prospecting License by NMDC. Four (4) blocks have been demarcated out of same Five (5) blocks as given above by MECL and presented here for G-3 level of exploration.
- 1.5.6 Exploration for precious stones is given top priority by Govt. of India, after amendment of MMDR act 2015. Keeping this in view, the present proposal is being put up for Preliminary exploration (G-3). Consequent upon positive outcome, the exploration programme shall follow G-2 route, which may facilitate state government for auctioning of the block.

2.0.0 Location and Accessibility

- 2.0.1 The proposed area falls in Survey of India Toposheet No. 54 L/09, 54 K/12 & 54 K/16, in Tikamgarh District of Madhya Pradesh.
- 2.0.2 The proposed study area lies at about 65km North-West of Tikamgarh District head quarter. The block is connected through state highway 539, from Tikamgarh in North Western direction. The interior locations of the area are accessible through fair weather jeepable tracks.

- 2.0.3 The nearest railway station is Tikamgarh (65 km) in Madhya Pradesh State and Jhansi Railway station. (45Km) falling in Uttar Pradesh State. The nearest airport is Khajuraho Airport, airport is located 175 km in south-east direction from the blocks.

2.1.0 Block description

- 2.1.1 Tikamgarh Diamond exploration is cluster of Four (4) blocks falling in Survey of India Toposheet No. 54 L/09, 54 K/12 & 54 K/16 and covers an area of 109.68sq.km and all the four blocks are in close vicinity to each other. Villages falling in the proposed area are Sunrai Khas, Papawani, Dhauna, Chhevalmata ka Khirk, Jherakhas, Acharra, Kumharanyas, Hanota, Darganykalan, PanchampuraJalandarpur, Gailwara, Bachora, Birorakhet, Uttara Birori, & Prithvipur of Tikamgarh district, Madhya Pradesh. The block location on toposheet is presented as **Plate-I**. The details of block Co-ordinates with their corner points are given as below **Table No.-I**.

Tikamgarh Diamond block is a cluster of four blocks as sub-blocks A, B, C, Total area of the Tikamgarh Cluster is 109.68 sq.km.

**Co-ordinates of the Four (4) diamond blocks of Tikamgarh district,
Madhya Pradesh**

Table – I

Block	Corner Point	Latitude	Longitude	Area (sq.km)
Tikamgarh A	A	25°11'37.00"	78°40'00.00"	10.96
	B	25°13'27.00"	78°40'00.00"	
	C	25°13'27.00"	78°38'05.00"	
	D	25°11'37.00"	78°38'05.00"	
Tikamgarh B	A	25°13'11.61"	78°47'17.00"	76.21
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	G	25°10'55.41"	78°44'19.68"	
	H	25°13'11.61"	78°47'17.00"	
	I	25°13'09.04"	78°48'31.52"	
	J	25°12'04.79"	78°50'07.89"	
	K	25°09'04.91"	78°49'28.06"	
Tikamgarh C	A	25°01'22.00"	78°39'40.00"	2.35
	B	25°01'22.00"	78°40'34.00"	
	C	25°02'12.00"	78°39'40.00"	
	D	25°02'12.00"	78°40'34.00"	
Tikamgarh D	A	25°57'25.00"	78°41'14.00"	20.16
	B	25°57'25.00"	78°44'31.00"	
	C	25°58'60.00"	78°44'31.00"	
	D	25°58'60.00"	78°41'14.00"	
			Total Area	109.68

2.2.0 Physiography

- 2.2.1 Geographically, Tikamgarh forms nearly the centre of the Bundelkhand Region that lies between the Vindhyan plateau in the south and the great Ganga-Yamuna plains in the north. In general, the district has a distinct slope toward the north-east. The slope is relatively more marked in Tikamgarh district, because the southwestern parts of the district nearly touches the high Vindhyan plateau.
- 2.2.2 Maximum and Minimum elevation in the proposed blocks is 340 m and 240m above mean sea level respectively.

2.3.0 Drainage

- 2.3.1 Tikamgarh, like almost all districts of India is criss-crossed and bounded by several rivers. Jamni, Betwa and Dhasan are major rivers flowing in this area
- 2.3.2 The proposed area falls in between river basins of Jamni and Betwa.
 - a. **Betwa basin:** Most of the region in this basin comprises of the Niwari block (Niwari tehsil) which makes the north western part of the district. It comprises of sub basins of two rivers namely Betwa and Jamni. The Bundelkhand plateau starts from the northern part of this basin. This river touches the boundary of the district at Badora village and flows along the boundary of the district for almost 14 kms, before flowing into the Tikamgarh district and re-entering Jhansi tehsil at Banguan village. In the district, this river has been dammed at Dhukuwa and Parischa tributaries of Betwa: Besides Dhasan, some minor streams flowing from the hills of Moth, Jhansi and Mau-Ranipur tehsils form the tributaries of the Betwa river. An important stream is the Barwa which has been dammed to form Barwa Sagar lake in the district.
 - b. **Jamni basin:** This is a tributary of Betwa river, which flows across on the western boundary of the district, that forms the natural boundary of the district. The mean elevation of this region varies from 300 to 400 meters above mean sea level.

2.4.0 Climate

- 2.4.1 The climate of Tikamgarh district is semi- tropical, characterized by hot summer and well distributed rainfall during the south west monsoon season. Mean monthly max. temperature of the district varies between 42°C in May, which is the hottest month and January is the coldest month with the temperature falling as low as 24.3°C. Mean monthly minimum temperature of the district varies between 26°C in June to 7°C in January.

2.5.0 Flora and Fauna

- 2.5.1 Tikamgarh district has a southern tropical dry deciduous type of forest climate. About 6% of the total land is covered by forest. Earlier the area comprised dense forests but due to a rising demand for wood and agriculture expansion, the level of deforestation increased. A timber forest lies near Orchha town and around Betwa and Jamuni rivers. The non-timber forest of the district consists of Tendu, Seja, Dhawa, Gunja Salai, Mahuwa, Baheda, Palash, Amla, Bel and Bamboo. In the non-timber forest, the medicinal plants have the potential to be a major source of livelihood for the people residing near forest area
- 2.5.2 All wild animals have become a rare sight in Bundelkhand, even in designated sanctuaries, Orchha Wild life sanctuary which covers an area of 45 sq.km is located at a distance of 35 km in North-Western direction from the blocks. Though one may not enjoy the pleasure of spotting tigers and leopards, yet one can find many interesting fauna like spotted deer, Blue Bull, Peacock, Wild pig, Monkey, Jackal, Nilgai, Sloth Bear and many

such species. But what appeals more than anything is the Bird watching experience one gets to enjoy in Orchha Wildlife Sanctuary.

3.0.0 Regional Geology

3.0.1 Geologically, Tikamgarh is part of the Bundelkhand craton, which is formed of the oldest Granites and Gneisses of the Achaean age. the district is almost entirely composed of massive Granites. The Granites are criss-crossed by a number of Quartzite and Quartz Reef aligned in the northeast-southwest (NE-SW) direction. In the southeast, there are a couple of outcrops of Basic Dykes of Dolerite lying in the NE-SW direction; these are aligned orthogonally to the Quartz Reefs. The river islands formed by the braiding of Jamni and Betwa in the northwest are composed of rich alluvial deposits that support the few patches of thick forests in the district.

The Regional Geological Map with proposed Block is furnished as **Plate-II**.

3.1.0 Geology of the Block

3.1.1 The area forms the southern part of the Bundelkhand Granitoid Complex (BGC) which is overlain by Paleoproterozoic Bijawars in the southeast by Meso-Neoproterozoic Vindhyan super group in the south and west by Quaternary Ganga/Yamuna plains in the north.

3.1.2 Mostly the lithology of the area is dominated by BGC represented by pink, grey granites and in eastern part of the block area, the BGC rock types are characterised by having large number of enclaves of older rocks viz: - Epidiorites, amphibolites and hornblende-chlorite schists; garnetiferous tremolite schists and amphibolites; mica schists; biotite-quartz granulitic rocks and (biotite) quartzites; quartz-magnetite rocks and garnetiferous quartz granulite.

3.1.3 Older rocks as given in 3.1.2 occur in the form of irregular patches while others are in the form of bands. In most cases, the contact of these enclaves with the adjoining granites is sharp while in a few instances, gradational contacts are also met with. The trend of these bands and the strike of foliation in schists, vary visually from N40°W-S40°E and N80°W-S80°E, veering at times to East-west; few bands also trend between NNE-SSW and NE-SW.

3.1.4 According to Shri Dass, the emplacement of the quartz reefs, characteristic of the Bundelkhand granite-gneiss country appears to have been controlled by the pre-existing joints in the granites. The reefs are moderately sheared and crushed at places.

The general sequence of rock formations found in the area is as given below:

Table I
Lithostratigraphy of the Proposed Area (After GSI, 1995):

Age	Super Group/Group/Formation	Lithology	Exposure
Quaternary	Sand / Alluvium	Loose sand, alluvium and clay	Exposed in Northern part of the district
----Unconformity----			
Paleo-	Bijawar Group	Gangau Sub-Group	

Age	Super Group/Group/Formation	Lithology	Exposure
		----Unconformity----	Exposed in Southern part of the district
		Moli Sub-Group	
----Unconformity-----			
Archean	Bundelkhand Gneissic complex	Quartz Reefs/ Basi dykes	The maximum area covered by this group of rock
		Granite – Aplitic	
		Granite	
		Migmatite	
		Amphibolite	
		Unclassified granite and granite gneiss / meta sediments	

3.2.0 Geomorphology:

- 3.2.1 Geomorphologically, the district is dominated by pediplains formed by the erosion of Granites. Harder rock material resistant to erosion has taken the form of Inselbergs. Such Inselbergs, rising sharply from the surface in a conical form, are a distinctive feature of Tikamgarh.
- 3.2.2 The pediplains that cover three-fourth of the surface are moderately buried by weathered material offering good support for agriculture. Near Betwa and Jamni in the north, there is an extent of weathered bedrock with thin or no soil cover; such a landform is termed shallow Buried Pediment.
- 3.2.3 Around Jataara and Prithvipur towns, there are also stretches of shallow Buried pediment interspersed with Inselbergs; this landform is known as pediment Inselberg complex.
- 3.2.4 Out of the proposed four (4) blocks 3 blocks are falling under shallow buried pediment and one block is falling under inselberg landform.

4.0.0 Previous Work

- 4.1.1 The earliest reference to the Bundelkhand area is by Medlicott (1859) who mapped in various parts of the present Madhya Pradesh area between 1860 and 1869. Hacket (1870), Mallet (1872) and Wilson also had carried out geological survey in Bundelkhand area.
- 4.1.2 Other geological investigations relating to minerals etc., in the Bundelkhand area were also carried out by Chatterjee (1941-42), Mehta (1944-45), Krishnaswamy (1945-46) and Roy Chowdhury (1947-48).
- 4.1.3 FS: 1953-59, Systematic Geological mapping was done in an area of 345sq.km falling in survey of India topo sheet 54 L/5 & 54 L/9 was mapped on the scale of 1:63,360 by Shri S.Venkatraman, Assistant Geologist. It was concluded that major portion of the area is occupied by Bundelkhand granites, which show variation in colour (from pink to grey), texture (coarse to fine grained, at places porphyritic) and mineralogical composition. The medium grained pink granite, medium grained grey granite and fine-grained pink granites bearing some Ferro magnesium minerals are the dominant granitic rocks of the areas. The granites bear a large number of inclusions of amphibolite, quartz and schists. The granites and gneisses in general are either massive or feebly foliated. The granites are traversed by quartz reefs and dolerite dykes. The quartz reefs usually trend in NE-SW direction while the dolerite dykes' trend in NW-SE direction. Though there is a wide

variation in the direction of joints developed in the granites, the sets more commonly seen strike in NW-SE direction. **This area falls out of the present proposed area.**

- 4.1.4 FS: 1959-60 Shri A.S. Dass, Assistant Geologist, carried out systematic mapping of the Bundelkhand granites and gneisses in the Jhansi District, UP and intervening parts of Tikamgarh District, MP, falling in the Toposheet Nos. 54O/03, 54K/15 and 54K/16, on the scale of 1:63,360. An area of about 735 sq.km was mapped by him and in addition an area of about 122 sq. km was mapped collectively with Sarvashri Kedar Narain, Geologist (Sr.) and H.N. Singh, Geologist.
- 4.1.4.1 It was recommended in the report for further exploration of pyrophyllite and iron-ore after observing and studying respective deposits.

- 4.1.5 NGCM: FS 1977-78; Geochemical survey for Base metal mineralization in Garhmau area, Jhansi district Karesrakalan and Bar areas Lalitpur district, by Shri B Dayal (Sr Geo) and A.K.Rao (Jr Geo). Bar area falls in toposheet 54 L/09. **This area falls out of the present proposed area.**

- 4.1.6 NGCM:2004-2008, Regional geochemical mapping of the Western Part of Bundhelkhand Granitoid complex, UP by Shri S.P.Nim (Sr Geo) et al, An area of 3,500 sq km area covering toposheets Nos. 54L/5, 7, 9, 10, 11 and 15 was geochemically mapped on 1:50,000 scale. A total of 3,500 stream sediment /slope wash samples were collected from 1kmx1km grids. Forty-five each of regolith 'R', -soil 'C' and 46 water 'W' samples representing 5' x 5' grids were also collected. The stream sediment, soil 'C' and regolith 'R' samples were preserved in the repository for future reference. Stream sediment /slope wash samples were composited to represent 2km x 2km grids for chemical analysis. It was concluded that Th, U and Sr are high in eastern part of toposheet No. 54L/9; U, Zr, Nb, Y and Sc are high in northern part of toposheet No. 54L/5 and 9

- 4.1.7 NGCM: **FS 1999-2004**, A total of 6117 sq. km area was covered on 1:50, 000 scale in parts of toposheet no. 54K/6,7,8,10,11,12,13,14,15,16; 54O/1,2,3,4 and 54L/5&6. The objective of the item was to generate systematic baseline geochemical data for production of geochemical maps, understanding the crustal growth, mineral potential soil fertility and human & animal health. By R Shukla Sr Geologist et al, identified the potential zone for Mo are around Kolwan and Tilhata Chota (54K/11) and Kuraicha(54O/04). Tungsten and tin show higher values in stream sediments west of Kuraicha. Pb is concentrated in soil samples around migmatite and grey granite exposures in Marh area. Zn is present in good amount in sediments around mylonitised rocks. Li, Co, Cr, Cu and Ni are high around Bargaon (54O/4) where basic and banded magnetite quartzite having sulphide specks are exposed. The areas with values above threshold are also critical for evaluation
- 4.1.8 NGPM: FS-1986-88, Gravity and magnetic survey for locating Kimberlite pipes in the granitic terrain around Ajaigarh area district Panna and Harkanpura area dist Tikamgarh was carried out by Shri A.C.Khare Sr;Geophysist, et al. **This area is falling in 80km NE from the present proposed blocks**, recommendations given for Harkanpura area is as below as likely a kimberlite body is noticed in this area.

4.1.8.1 The gravity highs No. III of Ajaigarh area and No. I of Harkanpura area may be tested by vertical drilling upto the depths of 700 and 800 metres respectively at the anomaly centres (N Lats. 24°55'00"E Longs. 80°16'35" and N Lats. 25°14'30": E Longs. 79°00'38"). Initially anomaly No. III of Ajaigarh area may be tested as its causative body appears to be a shallower.

4.1.8.2 The gravity 'low' may first be examined by Electrical Resistivity methods to ascertain whether anyone of them shows the characteristic resistivity picture normally recorded over weathered kimberlite pipes Simultaneously chemical

analysis of the soils over the anomaly zone may also be carried out to select the most interesting anomaly, which may then be test drilled.

- 4.1.9 NGPM: F.S. 2002-2003, Ground evaluation of aerogeophysical anomalies by integrated approach was carried out over an area of 2800 sq.km in areas falling for topo sheet 54 K/8,11,12 & 16 of Jhansi and Lalitpur dist of U.P and Datia, Shivpuri and Tikamgarh areas of M.P. quantum of work included collection of 303 SSS, 173 Soil Samples, 116 PS.
 - 4.1.9.1 prognostication map of Dr. C Ramachandra and Acharya (2000) on a common 1:50,000 scale with an aim to evaluate an integrated overlay of these thematic layers for facilitating selection of areas for mineral potential and locating Kimberlite clan rocks (KCR) was used.
 - 4.1.9.2 An ultramafic body showing cumulative thickness of 600 m x 50m was encountered in the area located south of Orchha, Tikamgarh district (M.P.) in toposheet no-54 K/11. Petrographic and XRF studies of samples of this rock have confirmed its identification as meta-ultramafite and presence of MgO upto 20-52%, silica varying from 47 to 75% and P2 O5 content of 0.07% Besides, a kimberlite indicator mineral i.e. magnesium chromite was found in two of the stream sediment samples collected from nearly 2 km South of Orchha. These findings were reported for the first time in Jhansi area. **This area is falling within 15km radius from the proposed block.**
 - 4.1.9.3 The areas located near NW of village Bijauli and 1.5 Km. SE of village Gujarra Kalan (Toposheet no. 54 K/11) show a similar rock type belonging to lamprophyre clan. **This area is falling within 15km radius from the proposed block.**
 - 4.1.9.4 North western part of Prithvipur dist. Tikamgarh (Topo sheet 54 K/12), This area represents an intersection of Purakalan-Prithvipur-Nivari Fault/Fracture with E-W and NW-SE trending fault features spreading in radial pattern. This area has been interpreted to be very significant for the discovery of Kimberlite/Lamproite as well. **This area is falling within 15km radius from the proposed block.**
 - 4.1.9.5 Jhiron-Kasba area dist Tikamgarh (Topo sheet 54 K/12), This area appears to be very significant as favourable locale for Kimberlite clan rocks due to the presence of high-density fault/fracturing trending in all directions. Some cutting across and some rotating into Purakalan-Prithvipur – Nivari fault/fracture system (PPN). **This area is falling within 15km radius from the proposed block.**
- 4.1.10 Recognizing, that the source for the detrital diamonds recovered from the Vindhyan beds at different locations of 100km long Panna Diamond Belt (PDB) may be form conceivable pipes in area north of Vindhyan basin i.e., in the region presently occupied by the Bundelkhand Granites, Hence NMDC approached DGM, MP and was awarded an area of 2092 sq.km under Reconnaissance Permit (RP) (2009-2012).
- 4.1.11 NMDC has carried out literature study, geological mapping in 1:50000 scale and structural elements using Remote Sensing data – Remote Sensing data selected for the study was IRS-P6 (Resource Sat-1) which has best capabilities for geological and mineral exploration studies, LISS-III data with 23.5 m spatial resolution is used for RP appraisal, LISS-IV multispectral data with 5.8m spatial resolution is used for geological, structural and anomaly interpretation, identified anomalies and probable zones of diamond occurrences for further ground sampling and exploration. NMDC collected 348 stream sediments were collected from entire RP area and processed the same using Gerrytz Jigs and subsequent TBE and Magnetic separation, visual identification of indicator minerals. Basing on the out of the work as said, an area of 1000sq.km is considered interesting for further exploration.

- 4.1.12 NMDC conducted follow-up sampling in 1000 sq.km area of about 70 stream sediment samples (-2mm) from various second and third order streams, visual picking, microscopic sorting, EPMA analysis was done for recovered Kimberlite indicator minerals (KIMS) chromite and picro-Ilmenite from various catchments and demarcated five (5) blocks for further Prospecting and applied for PL. same five blocks are being proposed at G-3 level of exploration in this proposal. **These five (5) blocks constitute the present proposed four (4) blocks.**

4.2.0 Objectives of Proposed Exploration

- 4.2.1 Based on the evaluation of available geological data and reported probable occurrence of diamond in the blocks as given at the said block areas, the present exploration program has been formulated to fulfil the following objectives:
- 4.2.1.1 To carry out geological and structural mapping on 1:12,500 scale for demarcation of diamond hosted rock with structural features to identify the surface manifestations and lateral disposition of the mineralised zones.
 - 4.2.1.2 To collect surface (bedrock/stream) samples for separation of Heavy minerals samples, Hand picking of suspected Heavy minerals grains and analysing the suspected grains for EPMA which will decide further course of exploration program.
 - 4.2.1.3 Ground Geophysical Survey i.e., ground magnetic survey will be conducted in anomalous area identified based on surface sampling.
 - 4.2.1.4 To drill a total of 5 No. of scout boreholes (involving about 500m core drilling) in case, analytical results of surface samples being positive for next level of exploration under G-2 stage
 - 4.2.1.5 To estimate the volume of diamond hosted kimberlite rocks along with associated minerals/elements as per UNFC norms and Minerals (Evidence of Mineral Contents) Rules-2015 at G-3 level.
 - 4.2.1.6 To decide the future course of exploration (under G-3/2 level) based on the results of above exploration work.

5.0.0 Planned Methodology

- 5.1.0 In accordance to the objective set for the block, the exploration programme is proposed. The Exploration shall be carried out as per Minerals (Evidence of Mineral Contents) Rules-2015. Accordingly, the following Preliminary exploration (G-3 stage) scheme has been formulated, which comprises of Geological Mapping (1:12,500 scale), Surface sampling (Bedrock, stream), Ground Geophysical Survey with associated survey, chemical analysis and physical analysis in order to achieve the objectives. The details of phase wise different activities to be carried out are presented in subsequent paragraphs.

5.2.0 Phase wise exploration activities

- 5.2.1 **Exploration program:** Exploration is proposed in two phases,
- Phase-I:** Comprising of large-scale geological mapping of four blocks and Stream sediment / slope wash sampling. Review will be done after receiving the sampling results.
 - Phase-II:** Comprising of Geophysical survey (magnetic) and drilling.

5.2.2 Geological Mapping

Initially Geological Mapping will be done in the entire 109.68sq.km area on 1:12,500 scale as normal practice of NMET funded projects in G-3 stage. Aim of the Geological mapping is to identify kimberlitic exposures (Yellow/Blue ground) along with Rock types, their contact, structural features. Surface manifestations of the mineralisation available along with their disposition will be marked on the map. During large scale mapping the past known incidents, marker horizon of kimberlite bearing potential zones in correlation with indicator minerals viz. Pyrope garnet, high chrome chromite, picro-ilmenite, chrome diopside, diamond, phlogopite and olivine etc. will be mapped.

5.2.3 Geochemical Sampling

5.2.3.1 Surface sampling (Bed Rock/Stream sediment):

During the course of Large-Scale Geological Mapping the Bed rock samples (Grab Samples) from the outcrops, stream sediments samples from 2nd to 5th order drainage shall be collected in and around the identified anomalous zones by auger drilling. A total of 20 bed rock sample, stream sediment sample 53 in first phase and 215 in second phase (based on positive outcome of 1st phase) will be collected during the field work. Bed rock sample will be analysed for whole rock analysis as to know if any heavy minerals are present in the samples. Stream sediment samples will be analysed for heavy mineral separation, hand picking of suspected heavy minerals grains and then EPMA study.

5.2.4 Ground Geophysical Survey

5.2.4.1 The cumulative area of the four blocks is 109.68sq.km. In general, the area is undulating with ridges covered by partly forest area. On interpretation of data of large-scale geological mapping, geochemical sampling (Bedrock & Stream Sediment sampling), ground Geophysical Survey (magnetic) will be carried out to assess the continuity of mineral hosted zones in potential area. The ground geophysical survey programme has been clubbed in the exploration programme. In the ground geophysical survey i.e. Magnetic Survey shall be proposed.

5.2.4.2 Integrated Geophysical Surveys i.e., Ground Magnetic have been planned to carry out in identified kimberlite potential zone for mineralisation of diamond in proposed area. The survey has been planned in a 100m line spacing & 10m station spacing for Magnetic Survey. The number of stations for Magnetic will be decided after the finalising of potential zones.

5.2.4.3 NGPM and Aero Geophysical data should be obtained from GSI for analysing and demarcating potential areas.

5.2.5 Surveying:

As exploration work is of Preliminary exploration (G-3 level), no detailed survey work is planned. The block boundary of sub blocks will be surveyed by GPS. Borehole fixation and determination of reduced level and co-ordinates of the scout boreholes only will be undertaken by DGPS at the time of extended G-3 level of exploration.

5.2.6 Core drilling:

Based on Geological Mapping, Geochemical and stream sediment sample results, the potential zones will be marked. To find out the disposition of potential kimberlite zones in strike & dip wise, a few scout boreholes involving 500m of drilling will be carried out for upper level of intersection of mineralized zones (Kimberlite Indicator Minerals) in extended G-3 stage. About 200 primary samples will be extracted from core of drilled boreholes for KIM and EPMA studies. Core drilling activity will be started in phase II.

5.2.7 Petrological & Mineralogical Studies:

During the course of Geological Mapping and drilling 15 samples from various litho units from surface and drill core will be studied for petrography

6.0.0 Nature, Quantum and Target

Details of the particular, Quantum and the targets are tabulated in **Table No.-III.**

Table – III
Envisaged quantum of proposed work in four (4) blocks falling in Tikamgarh District, MP

Sl. No.	Item of Work	Unit	Tikamgarh Block details			
			Block-A	Block-B	Block-C	Block-D
PHASE – I						
1	Geological Mapping (on 1:12,500 Scale)	Sq km	10.96	76,21	2.35	20.16
	a) Charges for one Geologist per day at HQ	Days	90			
	b) Charges for one Geologist per day in Field (without labour)	Days	180			
2	Geochemical Sampling					
	a) Bed rock sampling	Nos.	3	10	2	5
	b) Regional Stream Sampling	Nos.	8	30	4	11
	c) Follow-up Stream Sediment	Nos.	30	120	20	45
PHASE – II						
3	Topographical Survey* (on 1:12,500 Scale)	Sq km				
	a) Bore Hole Fixation* (Scout Boreholes)	Nos	6			
4	Geophysical Survey*					
	Magnetic Survey (200 m line spacing, 50 m station spacing)	No. of Station	1000			
5	Core Drilling **					
	a) Drilling, total 5 borehole	m.	500			
Laboratory analysis will be in commensurate with phase wise exploration program						
6	Laboratory Studies					
	i) Stream Sediment Sample	Nos.				
	a) Separation of Heavy minerals from stream sediment samples (Follow up samples)	Nos.	8+30 = 38	30+120 = 150	4+20 =24	11+45 =56
	b) Hand picking of suspected Heavy minerals grains		38	150	24	56
	c) EPMA studies for suspected Heavy Mineral grains		25% positivity i.e., 40 samples 200 hr for EPMA			
	ii) Bed Rock Sample					
	a) Whole rock analysis	Nos.	5	5	5	5
	iii) Core Drilling (Primary) Samples**					
	a) Separation of Heavy minerals from drill samples	Nos	200			
	b) Hand picking of suspected Heavy minerals grains		200			
	c) EPMA studies for suspected Heavy Mineral grains		25% positivity i.e., 50 samples			
7	Petrological Samples (Surface Samples) #					
	a) Preparation of Thin Section	Nos	15			
	b) Study of Thin Section	Nos	15			
8	Preparation of Exploration Proposal/Report (5 Hard copies with a soft copy)	Nos.	1			

Note: 1) The number of stations for Magnetic survey will be decide after the finalising of potential zones.

2) The actual number of suspected grains for EPMA will be confirmed after microscopic study.

7.0.0 Manpower Deployment

Manpower deployment List will be provided later.

8.0.0 Break-up of Expenditure

8.0.1 Cost has been estimated based on actual schedule of rates mandated in the circular OM No. 61/1/2018/NMET dated 31st March 2020 for NMET funded Projects. The total estimated cost is Rs 291.94 Lakhs. The summary of cost estimates for Preliminary exploration (G-3 Level) is given in Table No.-IV and details of cost estimates are given in Table No. –V.

Table No-IV
Summary of Cost Estimates for Preliminary exploration (G-3 Level)

Sl. No.	Item	Total Estimated Cost (Rs.)
1	Geological Mapping (LSM), Other Geological Work	33,83,400
2	Geophysical Survey	30,44,220
3	Drilling & associated works	66,92,240
4	Laboratory Studies	1,03,30,575
	Sub Total (1 to 5)	2,34,50,435
7	Exploration Report Preparation	9,00,000
8	Proposal Preparation	3,80,000
9	Peer review charges	10,000
	Sub Total (1 to 9)	2,47,40,435
10	GST 18%	44,53,278
	Total including GST:	2,91,93,713
	Say Rs. In Lakh	291.94

List of Plates:

- 1 Plate-I: Location Map of Tikamgarh blocks falling in toposheet nos. 54 L/09, K/12/16, Tikamgarh District, State Madhya Pradesh.
- 2 Plate-II: Regional Geological Plan showing the proposed blocks.
- 3 Plate-III: Block Geological Map (Source: BHUKOSH).

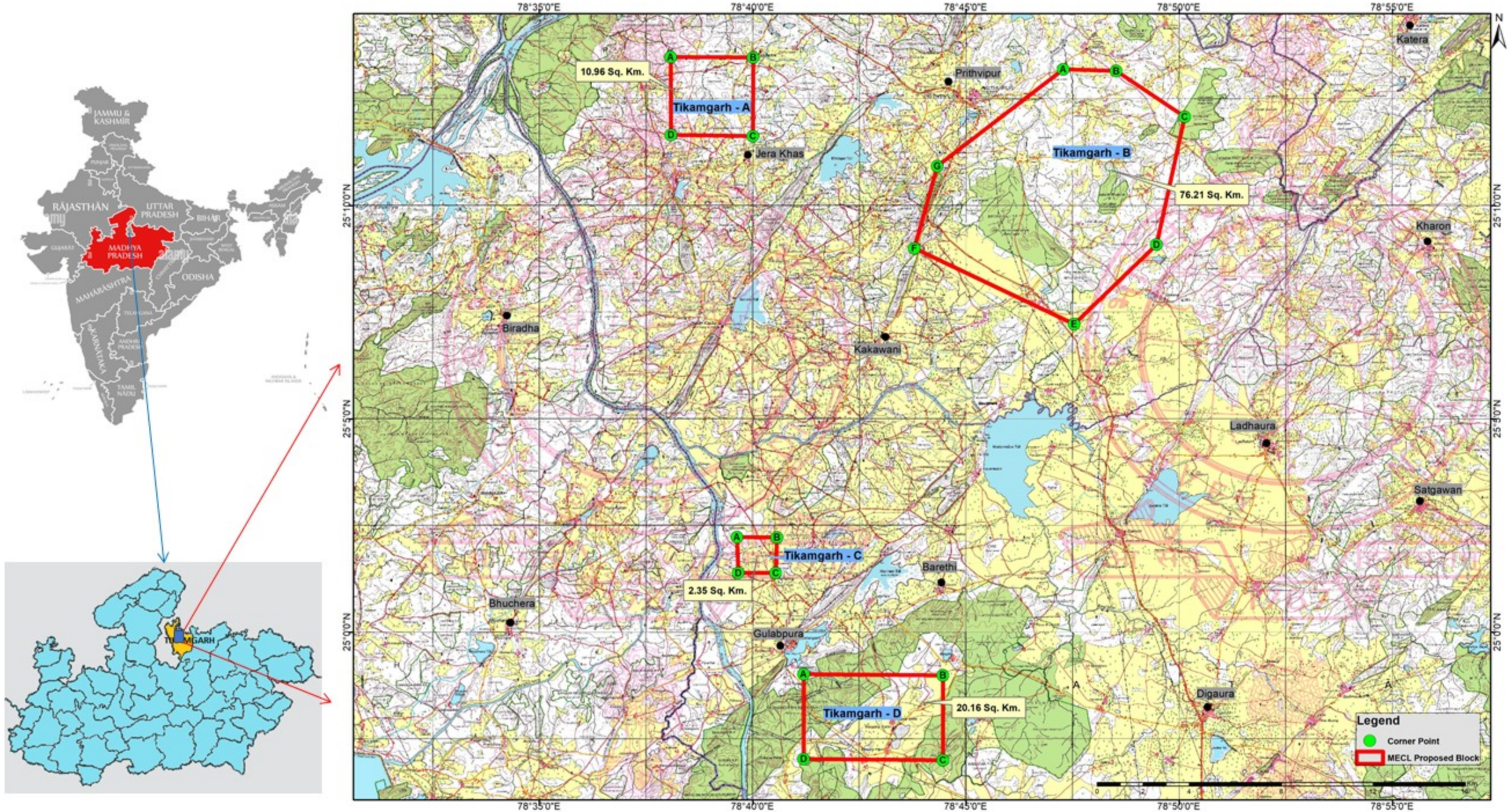
Tentative Time schedule / Action plan of Preliminary Exploration (G-3 level) for Diamond in Tikamgarh Cluster for diamond exploration, Tikamgarh Dist, Madhya Pradesh																			
S.No.	Activities	MONTHS																	
		1	2	3	4	5	6		7	8	9	10		11	12	13	14	15	
2	Geologist at HQ							R e v i e w					R e v i e w						
3	Camp setting																		
4	Large Scale Geological mapping & Sampling (2 Party)																		
5	Sample preparation (1 Party days)																		
6	Analytical work																		
8	Geophysical survey (2 party)																		
9	Survey work for Geophysical Survey (1 Party)																		
10	Geophysicist at HQ																		
11	Exploratory mining for trenching & Pitting																		
12	Sample preparation (2 Party days)																		
13	Analytical work																		
14	Drilling 500m																		
15	Geologist Party for logging																		
16	Sample preparation for Drill samples (1 Party days)																		
18	Camp winding																		
19	Analytical work drill core samples																		
20	Geologist at HQ																		
21	Geological report																		
22	Peer Review																		
* Commencement of project will be reckoned from the day the exploration acreage is available along with all statutory clearances																			
*Time loss on account of monsoon/agricultural activity/forest clearance/ local law & order problems will be addition to above time line.																			

Cost Sheet for Preliminary exploration G-3 Level) for Diamond in Tikamgarh Cluster for diamond exploration, Tikamgarh Dist., Madhya Pradesh
Total Area - 109.68 Sq.km; Nos. of Borehole - 5 ; Borehole depth range - 500m ; Completion Time - 15 Months

Sl. No	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC-Item-S. No.	Rates as per SoC	Qty.	Total Amount (Rs)	
1	Geological, Sampling & Survey Days						
	Large scale (LSM) Geological mapping/ Detailed Mapping / Trenching / Drilling						
1.1	Geologist man days (2 party Field)	days	1.2	11,000	180	9,80,000	
1.2	Labour Charges for Mapping work Base rate - Rs. 479/ per day	per worker	5.7	479	360	1,72,440	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. - whichever is higher
1.3	Geologist man days (HQ)	days	1.3	9,000	90	8,10,000	(Mineral identification days by 2 geologists included)
1.4	Labour Charges for Drilling/Logging (Field) Base rate - Rs. 479/ per day	per worker	5.7	479	0	-	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. - whichever is higher
1.5	Sampling Charges (Geochemical /Trenching/Pitting/Drilling)	day	1.5.2	5,100	60	3,06,000	
1.6	Labour Charges for Sampling Work Base rate - Rs. 479/ per day	day	5.7	479	240	1,14,960	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. - whichever is higher
	Sub-Total 1					33,83,400	
2	Geophysical Surveys*						
2.1	Magnetic Surveys (10–30-line km)	per station	3.2a	1,800	1000	18,00,000	Modification will be done after the review of the work
2.3	Geophysicist man days for Geophysical Survey	days	3.18	11,000	60	6,60,000	Modification will be done after the review of the work
2.4	Surveyor Charges	days	1.6.1.a	8,300	60	4,98,000	Modification will be done after the review of the work
2.5	Labours Charges for Survey Work Base rate - Rs. 479/ per day	per worker	5.7	479	180	86,220	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. - whichever is higher
	Sub-Total 2					30,44,220	
3	Drilling**						
3.1	a) Drilling up to 300m Rigs) (Medium Hard Rock)	per m	2.2.1.4 a	10,100	500	50,50,000	
3.2	Borehole deviation survey	per m	2.2.6	330	500	1,65,000	
4.3	Borehole pillaring					-	
	a) construction of concrete pillar (12"x12"x30")	per bh	2.2.7.a	2,000	5	10,000	
3.4	Transportation of drill rigs & truck associated per drill (To & Fro from HQ)	per km	2.2.8	36	1400	50,400	Certification in this regard is required to be provided
3.5	Monthly accommodation charges for drilling camp	monthly	2.2.9	50,000	3	1,50,000	
3.6	a) Drilling camp setting (1 rigs)	per drill	2.2.9a	2,50,000	1	2,50,000	
3.7	b) Drilling camp winding (1 rigs)	per drill	2.2.9b	2,50,000	1	2,50,000	
3.8	Approach road making in rugged- hilly terrain (Flat terrain)	per km	2.2.10	22,020	7	1,54,140	Road Making will be considered as per the requirement and Road Making Charges will be reimbursed for max. 5 km.
3.9	Drill core preservation	per m	5.3	1590	250	3,97,500	This amount will be reimbursed after successful delivery of the cores to concerned libraries/authorities
3.10	Land/crop compensation	per borehole	5.6	20000	5	1,00,000	Amount will be reimbursed as per actuals or max. Rs. 20000 per BH with certification from local authorities
3.11	Demarcation Fixation of borehole and determination of co-ordinates & Reduced Level (RL) of the boreholes by DGPS (including charges for labours deployed for the work)	Per point of observation	1.6.2	19,200	6	1,15,200	
	Sub-Total 4					66,92,240	
5	Laboratory Studies						
5.1	Chemical Analysis						
	i) Surface sampling (Bed Rock Samples)						
	a) Whole rock analysis (Major oxides)	per sample	4.1.15a	4,200	20	84,000	
	ii) Stream Sample					-	

Sl. No	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC-Item-S. No.	Rates as per SoC	Qty.	Total Amount (Rs)	
	a. Separation of heavy minerals from stream sediment samples of - 2mm size through gravity and magnetic separation	per sample	4.3.6b	13,820	53+ 215 = 268	37,03,760	215 follow up samples, will be reimbursed as per actual nos of sample, Max. - 53+215 =268 samples
	b. Heavy mineral separation by liquid	per sample	4.3.6a	2,380	53+ 215 = 268	6,37,840	215 follow up samples, will be reimbursed as per actual nos of sample, Max. - 53+215 =268 samples
	c. EPMA studies for suspected Heavy Mineral grains	Per hour	4.4.1	8,540	200	17,08,000	As per actual (25% samples around 40 nos to be positive @ 15 grain)
5.2	ii) BH Sampling (Primary)						
	a. Separation of heavy minerals from drill samples of - 2mm size through gravity and magnetic separation	per sample	4.3.6b	13,820	200	27,64,000	will be reimbursed as per actual nos of sample; Max. 200 samples
	b. Heavy mineral separation by liquid	per sample	4.3.6a	2,380	200	4,76,000	will be reimbursed as per actual nos of sample; Max. 200 samples
	c. EPMA studies for suspected Heavy Mineral grains	Per hour	4.4.1	8,540	100	8,54,000	As per actual (20-25% samples around 30 nos to be positive @ 15 grain)
5.4	Petrological / Mineralographic studies					-	
	a) Preparation of thin section (Surface & BH)	per sample	4.3.1	2,353	15	35,295	
	b) Study of thin section for petrography	per sample	4.3.4	4,232	15	63,480	
	c) Digital photomicrograph of thin section	per sample	4.3.7	280	15	4,200	
	Sub-Total 5					1,03,30,575	
6	Total (1 to 5)					2,34,50,435	
7	Geological Report Preparation	Nos	5.2	A Minimum of Rs. 9 lakhs or 3% of the work	1	9,00,000	For the projects having cost up to exceeding Rs. 300 Lakhs: A Minimum of Rs.9 lakhs or 3% of the value of work whichever is more subject to a maximum amount of Rs. 20 lakh and Rs. 10000/- per each additional copy.
8	Preparation of Exploration Proposal	Nos	5.1	380000	1	3,80,000	EA has to submit the Hard Copies and the soft copy of the final proposal along with Maps and Plan as suggested by the TCC-NMET in its meeting while clearing the proposal.
9	Report Peer Review Charges	lumpsum	As per EC decision	10000	1	10,000	With handling Charges
10	Total Estimated Cost without GST (6+7+8+9)					2,47,40,435	
11	Provision for GST (18%)					44,53,278	GST will be reimbursed as per actual and as per notified prescribed rate
12	Total Estimated Cost with GST					2,91,93,713	
					Say, Rs. in Lakhs	291.94	
Note - 1. If any part of the project is outsourced, the amount will be reimbursed as per the Paragraph 3 of NMET SoC and Item no. 6 of NMET SoC. In case of execution of the project by EA on its own, a Certificate regarding non outsourcing of any component/project is required.							

PROPOSED RECONNAISSANCE SURVEY (G-4) BLOCK LOCATION MAP OF THE DIAMOND IN TIKAMGARH DISTRICT, MADHYA PRADESH



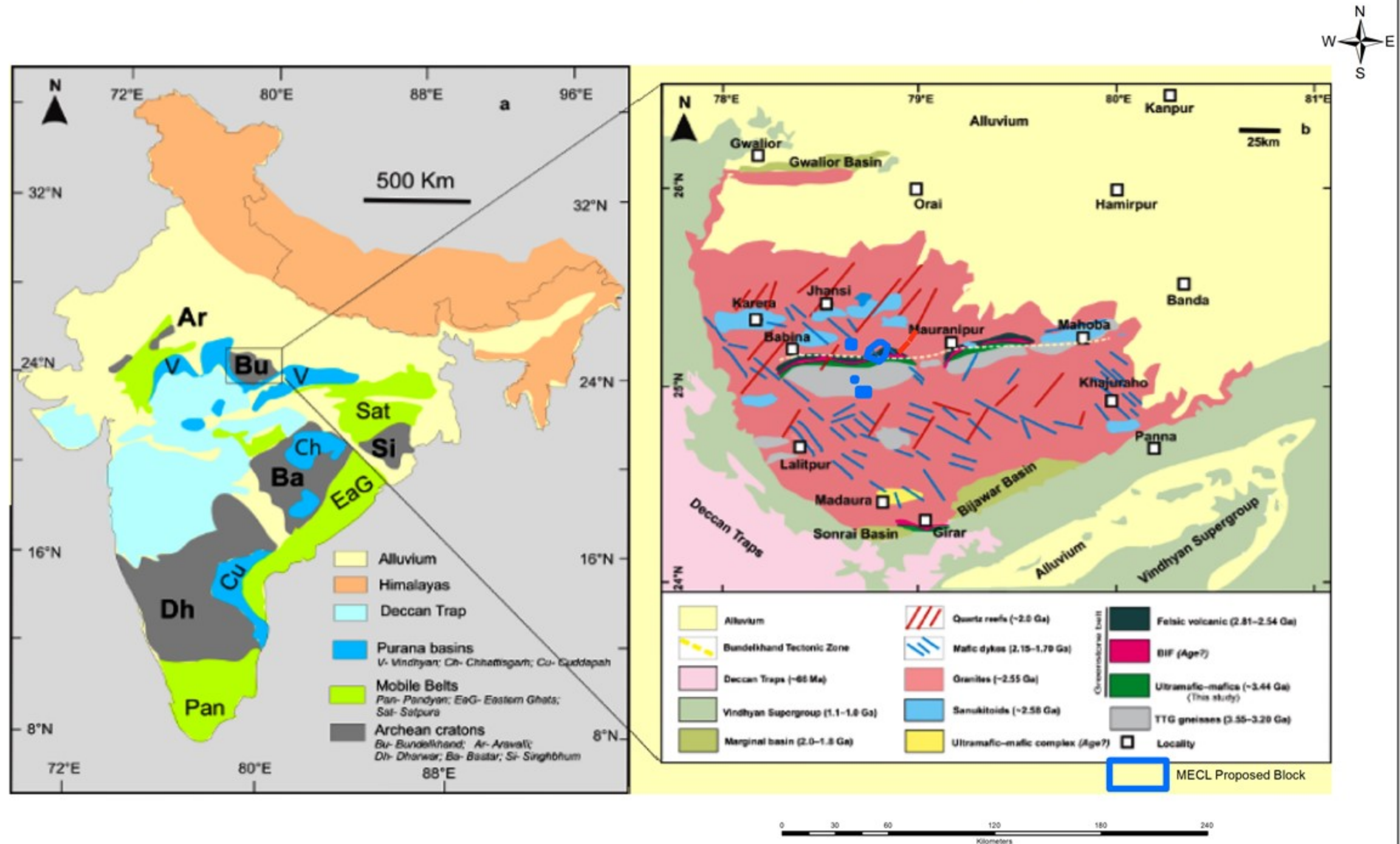
Tikamgarh - A Block, Toposheet No. 54K/12			
Name	Longitude	Latitude	Area
A	78°38'04.65"	25°13'28.65"	10.96 Sq. Km
B	78°40'00.81"	25°13'28.14"	
C	78°40'00.29"	25°11'37.64"	
D	78°38'05.17"	25°11'39.18"	

Tikamgarh - B Block, Toposheet No. 54K/12 & 16			
Name	Longitude	Latitude	Area
A	78°47'17.00"	25°13'11.61"	76.21 Sq. Km
B	78°48'31.52"	25°13'09.04"	
C	78°50'07.89"	25°12'04.79"	
D	78°49'28.06"	25°09'04.91"	
E	78°47'32.42"	25°07'13.12"	
F	78°43'47.56"	25°08'59.77"	
G	78°44'19.68"	25°10'55.41"	

Tikamgarh - C Block, Toposheet No. 54K/12			
Name	Longitude	Latitude	Area
A	78°39'38.23"	25°02'13.73"	2.35 Sq. Km
B	78°40'34.25"	25°02'13.22"	
C	78°40'32.71"	25°01'23.36"	
D	78°39'39.77"	25°01'23.36"	

Tikamgarh - D Block, Toposheet No. 54L/9			
Name	Longitude	Latitude	Area
A	78°41'11.77"	24°59'00.99"	20.16 Sq. Km
B	78°44'27.59"	24°58'59.45"	
C	78°44'27.59"	24°57'00.21"	
D	78°41'11.77"	24°57'01.75"	

Geological Map of Bundelkhand Craton showing Proposed Tikamgarh Diamond Block



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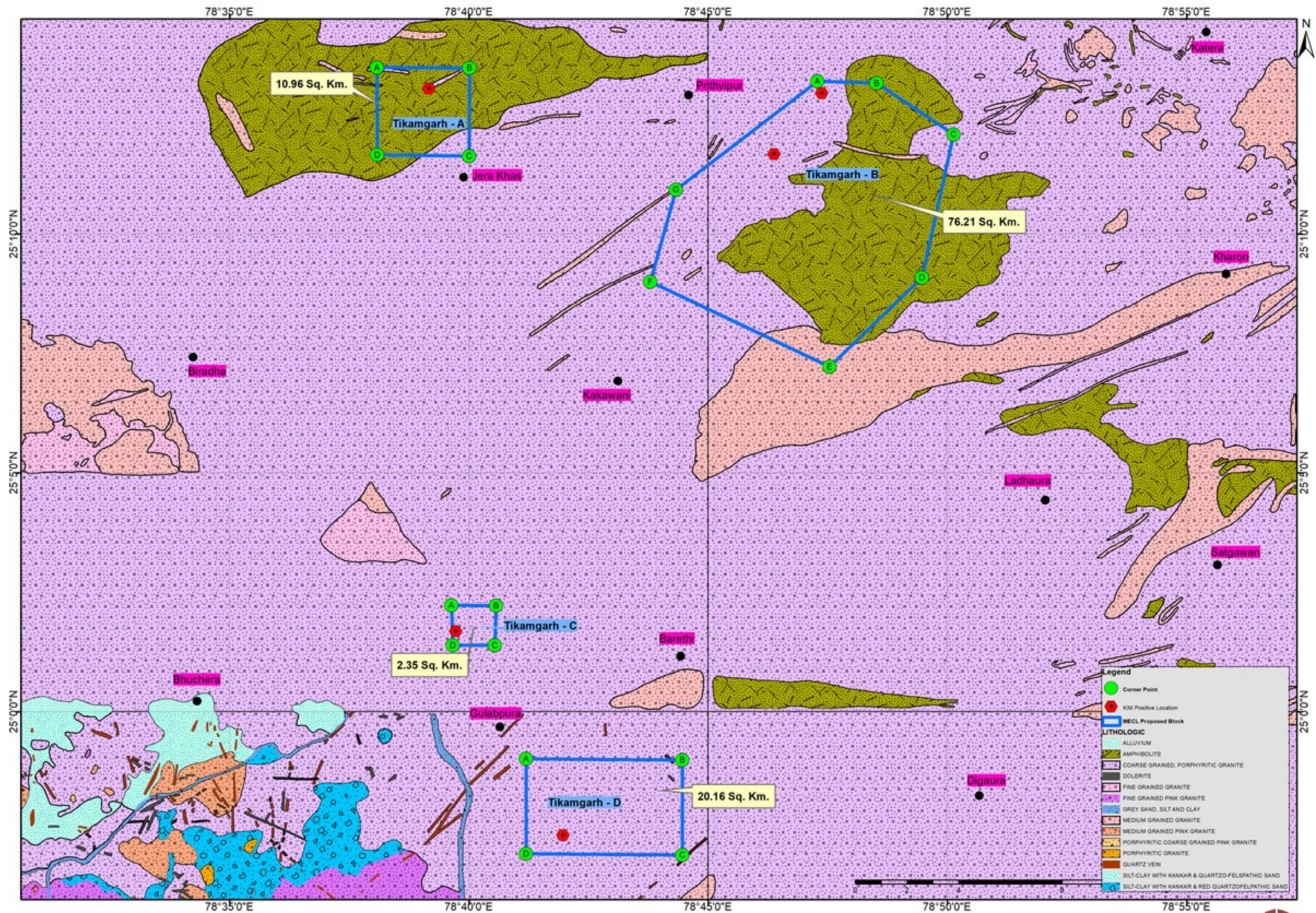
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Plate No. II

GEOLOGICAL MAP OF THE BLOCK (SOURCE: BHUKOSH)



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Plate No. III